

(HI,xnγ) 2011Si04

Type	Author	History	Literature Cutoff Date
Full Evaluation	E. Browne, J. K. Tuli	Citation NDS 145, 25 (2017)	1-Jul-2017

2011Si04: ⁷⁵As(²⁸Si,p3nγ), E=120 MeV. Measured Eγ, Iγ, γγ, γγ(θ)(DCO), γγ(θ,pol) (integrated polarization DCO values) using INGA array of 18 Clover detectors at IUAC facility in New Delhi. Comparison with deformed Hartree-Fock microscopic calculations and angular momentum projection techniques. Possible octupole correlations.
1977Pi01: ⁷⁰Ge(³²S,2pnγ) E=130 MeV; ⁹¹Zr(¹²C,4nγ), E=56 MeV Measured: γ, γγ, Xγ.
1974SmZV,1978Lu02: ⁹⁰Zr(¹²C,3nγ) E=56 MeV **1975Ki13** measured linear polarization of γ-rays in ⁹⁹Pd from the same reaction and deduced parities and multipolarities. Part of the decay scheme was misassigned to ⁹⁹Pd. **1978Lu02** measured particle-γ coincidence for ¹²C+⁹⁰Zr reaction at 56 MeV and found that a number of transitions assigned to ⁹⁹Pd must belong to ⁹⁹Rh, in agreement with the suggestion of **1977Pi01**.
1988Du07: ⁹⁶Ru(⁶Li,p2nγ) E=38 MeV Measured: γ, γγ, γ(θ), excit.

⁹⁹Pd Levels

E(level) [†]	Jπ [‡]	T _{1/2}	Comments
0.0	5/2 ⁺		
219.6 5	(3/2 ⁺)		
264.21 [#] 23	7/2 ⁺		
686.8 5	5/2 ⁺		
815.1 4	7/2 ⁺		
832.10 [@] 24	9/2 ⁺		
1070.0 [#] 3	11/2 ⁺		
1102.2 5	9/2 ⁺		
1467.8 4	(11/2 ⁺)		
1649.4 [@] 4	13/2 ⁺		
1718.5 [#] 4	15/2 ⁺		
1852.8 6	9/2 ⁺		
2017.3 ^{&} 5	11/2 ⁻		
2192.9 5	(15/2 ⁺)		
2205.6 6	15/2 ⁺		
2268.6 11	7/2 ⁺		
2421.4 [@] 4	17/2 ⁺		
2508.5 6	17/2 ⁺		
2600.1 ^a 5	19/2 ⁺		
2634.9 5	21/2 ⁺		
2706.2 ^{&} 5	15/2 ⁻		
3325.3 8	21/2 ⁺		
3327.2 7	21/2 ⁺		
3339.7 ^a 5	23/2 ⁺		
3395.4 ^{&} 5	19/2 ⁻		
3516.2 11	(17/2 ⁺)		
3546.2 5	25/2 ⁺		
3935.6 7	25/2 ⁺		
4014.2 ^{&} 5	23/2 ⁻		
4039.3 ^a 6	27/2 ⁺	<4 ns	T _{1/2} : From ⁹¹ Zr(¹² C,4nγ).
4759.5 7	29/2 ⁺		
4772.7 ^{&} 6	27/2 ⁻		
5015.0 7	29/2 ⁺		
5331.0 ^a 6	31/2 ⁺		Possible configuration= $\pi g_{9/2}^{-2} \otimes \nu g_{7/2} \otimes \nu d_{5/2}^2$ or $\pi g_{9/2}^{-4} \otimes \nu g_{7/2}$; maximum aligned state.
5510.1 8	33/2 ⁺		
5780.5 ^{&} 6	31/2 ⁻		

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(HI,xn γ) **2011Si04** (continued)

⁹⁹Pd Levels (continued)

E(level) [†]	J π [‡]	Comments
6540.8 ^a 8	35/2 ⁺	
6598.0 9		
6803.2 ^{&} 7	35/2 ⁻	
7074.4 9	37/2 ⁺	
7124.3 9		
7299.8 8	37/2 ⁺	
7914.7 12		
8010.4 ^a 9	39/2 ⁺	
8182.7 ^{&} 8	39/2 ⁻	Possible configuration= $\pi g_{9/2}^{-2} \otimes v g_{7/2}^2 \otimes v h_{11/2}$, maximum aligned state.
8454.3 12		
9412.3 11	43/2 ⁻	
9512.9 ^{&} 11	(43/2)	
9843.7 12	(45/2)	
9980.8 11		
11457.0 ^{&} 12	(47/2)	

[†] From least-squares fit to E γ data (by evaluators).

[‡] From 2011Si04.

Band(A): $K^\pi=3/2^+$, $v g_{7/2}^3 \otimes \pi g_{9/2}^6$.

@ Band(B): $K^\pi=1/2^+$, $v g_{7/2}^2 \otimes v d_{5/2} \otimes \pi g_{9/2}^6$.

& Band(C): Band based on 11/2⁻. Configurations= $K^\pi=1/2^-, 3/2^-$; $\pi g_{9/2}^6 \otimes v g_{9/2}^{10} \otimes v g_{7/2}^2 \otimes v h_{11/2}$ or $\pi g_{9/2}^6 \otimes v g_{9/2}^8 \otimes v g_{7/2}^2 \otimes v d_{5/2}^2 \otimes v h_{11/2}$.

^a Band(D): Band based on 19/2⁺. Configurations= $K^\pi=5/2^+$, $\pi g_{9/2}^6 \otimes v g_{7/2}^2 \otimes v h_{11/2}^2 \otimes v g_{9/2}^{-1}$ or $\pi g_{9/2}^5 \otimes \pi g_{7/2} \otimes v g_{7/2}^2 \otimes v h_{11/2}^2 \otimes v g_{9/2}^{-1}$, $K^\pi=19/2^+$; the latter is favored.

γ (⁹⁹Pd)

DCO ratios (2011Si04) correspond to gates on $\Delta J=2$ quadrupole transitions. Expected ratios are ≥ 1.0 for $\Delta J=2$, quadrupole and ≤ 0.6 for $\Delta J=1$, dipole transitions.

E γ #	I γ	E _i (level)	J π _i	E _f	J π _f	Comments
(35)		2634.9	21/2 ⁺	2600.1	19/2 ⁺	
178.1 7	1.7 3	2600.1	19/2 ⁺	2421.4	17/2 ⁺	DCO=0.65 7
178.9 7	0.8 1	5510.1	33/2 ⁺	5331.0	31/2 ⁺	
206.3 5	6.4 6	3546.2	25/2 ⁺	3339.7	23/2 ⁺	DCO=0.63 7
213.2 7	2.1 2	2634.9	21/2 ⁺	2421.4	17/2 ⁺	DCO=0.86 3
215.6 7	2.2 2	2421.4	17/2 ⁺	2205.6	15/2 ⁺	
219.6 7		219.6	(3/2 ⁺)	0.0	5/2 ⁺	
238.3 7	0.42 7	1070.0	11/2 ⁺	832.10	9/2 ⁺	DCO=0.59 6
264.2 3	100 5	264.21	7/2 ⁺	0.0	5/2 ⁺	DCO=0.57 4
287.0 7		1102.2	9/2 ⁺	815.1	7/2 ⁺	
315.8 7	1.2 1	5331.0	31/2 ⁺	5015.0	29/2 ⁺	DCO=0.45 8
384.6 7		1852.8	9/2 ⁺	1467.8	(11/2 ⁺)	
389.5 5	3.2 3	3935.6	25/2 ⁺	3546.2	25/2 ⁺	DCO=0.53 7
397.0 7	0.5 1	1467.8	(11/2 ⁺)	1070.0	11/2 ⁺	
422.9 7		686.8	5/2 ⁺	264.21	7/2 ⁺	
431.4 7	0.8 1	9843.7	(45/2)	9412.3	43/2 ⁻	
467.1 7		686.8	5/2 ⁺	219.6	(3/2 ⁺)	

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(HI,xn γ) 2011Si04 (continued) $\gamma(^{99}\text{Pd})$ (continued)

E_γ #	I_γ	$E_i(\text{level})$	J_i^π	E_f	J_f^π	Mult.	$\alpha^@$	Comments
467.8 7	1.3 1	4014.2	23/2 ⁻	3546.2	25/2 ⁺			
475.0 7	0.4 1	2192.9	(15/2 ⁺)	1718.5	15/2 ⁺			
486.9 7	2.9 2	2205.6	15/2 ⁺	1718.5	15/2 ⁺			
493.2 [±] 3	41.4 25	4039.3	27/2 ⁺	3546.2	25/2 ⁺	M1	0.00576	DCO=0.58 5 $\alpha(\text{K})=0.00504$ 7; $\alpha(\text{L})=0.000593$ 9; $\alpha(\text{M})=0.0001112$ 16 $\alpha(\text{N})=1.88\times 10^{-5}$ 3 POL=-0.04 3. DCO=0.51 10
533.3 7	2.6 2	7074.4	37/2 ⁺	6540.8	35/2 ⁺			
544 & 1		2192.9	(15/2 ⁺)	1649.4	13/2 ⁺			
551.0 7		815.1	7/2 ⁺	264.21	7/2 ⁺			
567.9 5	7.5 4	832.10	9/2 ⁺	264.21	7/2 ⁺			
570.8 7	2.0 5	5331.0	31/2 ⁺	4759.5	29/2 ⁺			
579.6 5	3.2 3	1649.4	13/2 ⁺	1070.0	11/2 ⁺			
595.6 7		815.1	7/2 ⁺	219.6	(3/2 ⁺)			
618.9 3	13.4 9	4014.2	23/2 ⁻	3395.4	19/2 ⁻	E2	0.00329	DCO=0.86 2 $\alpha(\text{K})=0.00286$ 4; $\alpha(\text{L})=0.000353$ 5; $\alpha(\text{M})=6.63\times 10^{-5}$ 10 $\alpha(\text{N})=1.107\times 10^{-5}$ 16 POL=+0.10 3.
636.2 7		1467.8	(11/2 ⁺)	832.10	9/2 ⁺			
648.7 3	93 5	1718.5	15/2 ⁺	1070.0	11/2 ⁺			DCO=0.93 8 POL=+0.012 4.
653.2 7		1467.8	(11/2 ⁺)	815.1	7/2 ⁺			
674.3 7	1.0 1	4014.2	23/2 ⁻	3339.7	23/2 ⁺			
686.6 7		686.8	5/2 ⁺	0.0	5/2 ⁺			
687.0 7	0.7 1	4014.2	23/2 ⁻	3327.2	21/2 ⁺			
689.1 5	7.5 6	3395.4	19/2 ⁻	2706.2	15/2 ⁻			DCO=1.10 8 DCO includes contribution from 689.3 γ .
689.3 5	4.8 4	2706.2	15/2 ⁻	2017.3	11/2 ⁻			
699.3 5	4.3 3	4039.3	27/2 ⁺	3339.7	23/2 ⁺			DCO=1.12 15
702.8 7	1.8 2	2421.4	17/2 ⁺	1718.5	15/2 ⁺			
704.7 3	18.4 12	3339.7	23/2 ⁺	2634.9	21/2 ⁺	M1	0.00248	DCO=0.65 12 $\alpha(\text{K})=0.00217$ 3; $\alpha(\text{L})=0.000253$ 4; $\alpha(\text{M})=4.74\times 10^{-5}$ 7 $\alpha(\text{N})=8.01\times 10^{-6}$ 12 E_γ : perhaps same As 705.4 placed from a 3306 level in (⁶ Li,p2n γ).
710.6 5	5.8 8	8010.4	39/2 ⁺	7299.8	37/2 ⁺			DCO=0.45 8
719.8 5	3.5 4	4759.5	29/2 ⁺	4039.3	27/2 ⁺			DCO=0.49 8 E_γ : perhaps same As 718.7 placed from a 2437.3 level in (⁶ Li,p2n γ).
725.3 7		2192.9	(15/2 ⁺)	1467.8	(11/2 ⁺)			
727.0 7	2.3 2	3327.2	21/2 ⁺	2600.1	19/2 ⁺			
739.4 5	5.2 4	3339.7	23/2 ⁺	2600.1	19/2 ⁺			DCO=0.92 12
751.0 7		1852.8	9/2 ⁺	1102.2	9/2 ⁺			
758.5 3	30.2 18	4772.7	27/2 ⁻	4014.2	23/2 ⁻			DCO=0.89 10 POL=+0.010 4.
759.1 5	6.0 5	7299.8	37/2 ⁺	6540.8	35/2 ⁺			
765.8 7	0.4 1	5780.5	31/2 ⁻	5015.0	29/2 ⁺			DCO=0.57 12
771.9 3	16.7 15	2421.4	17/2 ⁺	1649.4	13/2 ⁺			
805.7 3	94 6	1070.0	11/2 ⁺	264.21	7/2 ⁺			DCO=0.98 7 POL=+0.04 1.
815.2 7		815.1	7/2 ⁺	0.0	5/2 ⁺			
816.7 5	4.2 5	3325.3	21/2 ⁺	2508.5	17/2 ⁺			

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(HI,xn γ) 2011Si04 (continued) $\gamma(^{99}\text{Pd})$ (continued)

E_γ #	I_γ	E_i (level)	J_i^π	E_f	J_f^π	Mult.	$\alpha^@$	Comments
817.1 3	21.5 14	1649.4	13/2 ⁺	832.10	9/2 ⁺			DCO=0.92 10
832.1 3	27.8 17	832.10	9/2 ⁺	0.0	5/2 ⁺			E_γ : perhaps same As 832.0 placed from a 2481.6 level In ($^6\text{Li,p2n}\gamma$).
837.2 7	0.9 1	4772.7	27/2 ⁻	3935.6	25/2 ⁺			
838.5 7		1102.2	9/2 ⁺	264.21	7/2 ⁺			
859.1 5	7.0 8	2508.5	17/2 ⁺	1649.4	13/2 ⁺			DCO=0.98 11
881.7 3	77 4	2600.1	19/2 ⁺	1718.5	15/2 ⁺	E2	1.35×10^{-3}	DCO=0.98 9 $\alpha(\text{K})=0.001175$ 17; $\alpha(\text{L})=0.0001399$ 20; $\alpha(\text{M})=2.62 \times 10^{-5}$ 4 $\alpha(\text{N})=4.40 \times 10^{-6}$ 7 POL=+0.10 4.
911.4 [‡] 3	46 3	3546.2	25/2 ⁺	2634.9	21/2 ⁺	E2	1.24×10^{-3}	DCO=0.92 9 $\alpha(\text{K})=0.001087$ 16; $\alpha(\text{L})=0.0001292$ 19; $\alpha(\text{M})=2.42 \times 10^{-5}$ 4 $\alpha(\text{N})=4.07 \times 10^{-6}$ 6 POL=+0.04 1. E_γ : placed from a 3512 level In ($^6\text{Li,p2n}\gamma$).
916.0 [†]	[†]	3516.2	(17/2 ⁺)	2600.1	19/2 ⁺			
935.8 7	2.5 2	8010.4	39/2 ⁺	7074.4	37/2 ⁺			
947.5 7	1.5 1	2017.3	11/2 ⁻	1070.0	11/2 ⁺			
974.1 3	11.8 8	3395.4	19/2 ⁻	2421.4	17/2 ⁺	E1	4.52×10^{-4}	DCO=0.67 9 $\alpha(\text{K})=0.000397$ 6; $\alpha(\text{L})=4.52 \times 10^{-5}$ 7; $\alpha(\text{M})=8.44 \times 10^{-6}$ 12 $\alpha(\text{N})=1.422 \times 10^{-6}$ 20 POL=+0.03 1. DCO=0.61 7 DCO=1.1 3 POL=+0.03 1. Mult.: From DCO, POL. placed from 4519.7 level In ($^6\text{Li,p2n}\gamma$).
975.8 5	4.7 5	5015.0	29/2 ⁺	4039.3	27/2 ⁺			
1007.8 3	29.0 20	5780.5	31/2 ⁻	4772.7	27/2 ⁻	E2		
1020.8 7	2.1 2	5780.5	31/2 ⁻	4759.5	29/2 ⁺			
1022.7 3	26.4 15	6803.2	35/2 ⁻	5780.5	31/2 ⁻			DCO=0.85 10
1056.3 5	5.5 6	2706.2	15/2 ⁻	1649.4	13/2 ⁺	E1	3.87×10^{-4}	DCO=0.70 9 $\alpha(\text{K})=0.000340$ 5; $\alpha(\text{L})=3.87 \times 10^{-5}$ 6; $\alpha(\text{M})=7.22 \times 10^{-6}$ 11 $\alpha(\text{N})=1.218 \times 10^{-6}$ 17 POL=+0.08 3.
1102.3 7		1102.2	9/2 ⁺	0.0	5/2 ⁺			
1122.0 7		2192.9	(15/2 ⁺)	1070.0	11/2 ⁺			
1185.4 5	4.9 4	2017.3	11/2 ⁻	832.10	9/2 ⁺			
1203.0 7		1467.8	(11/2 ⁺)	264.21	7/2 ⁺			
1209.9 5	6.1 5	6540.8	35/2 ⁺	5331.0	31/2 ⁺			DCO=0.97 11
1229.5 7	2.6 2	9412.3	43/2 ⁻	8182.7	39/2 ⁻			DCO=0.82 15
1267.0 7	2.1 3	6598.0		5331.0	31/2 ⁺			
1291.9 3	14.6 12	5331.0	31/2 ⁺	4039.3	27/2 ⁺			DCO=0.85 9
1316.7 7	0.7 1	7914.7		6598.0				
1330.0 7	0.8 2	8454.3		7124.3				
1330.2 7	1.3 2	9512.9	(43/2)	8182.7	39/2 ⁻			
1379.2 3	15.0 12	4014.2	23/2 ⁻	2634.9	21/2 ⁺	E1	3.88×10^{-4}	DCO=0.57 14 $\alpha(\text{K})=0.000211$ 3; $\alpha(\text{L})=2.38 \times 10^{-5}$ 4; $\alpha(\text{M})=4.45 \times 10^{-6}$ 7 $\alpha(\text{N})=7.51 \times 10^{-7}$ 11; $\alpha(\text{IPF})=0.0001479$ 21 POL=+0.11 4. DCO and POL include contribution from 1379.5 γ .

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(HI,xn γ) 2011Si04 (continued) $\gamma(^{99}\text{Pd})$ (continued)

E_γ #	I_γ	$E_i(\text{level})$	J_i^π	E_f	J_f^π	E_γ #	I_γ	$E_i(\text{level})$	J_i^π	E_f	J_f^π
1379.5 5	4.8 5	8182.7	39/2 ⁻	6803.2	35/2 ⁻	1789.5 7	1.0 2	7299.8	37/2 ⁺	5510.1	33/2 ⁺
1436.5 †	†	2268.6	7/2 ⁺	832.10	9/2 ⁺	1793.3 7	1.0 2	7124.3		5331.0	31/2 ⁺
1469.6 7	1.5 1	8010.4	39/2 ⁺	6540.8	35/2 ⁺	1798.0 7	0.4 1	9980.8		8182.7	39/2 ⁻
1564.4 7	0.5 1	7074.4	37/2 ⁺	5510.1	33/2 ⁺	1944.1 7	0.18 7	11457.0	(47/2)	9512.9	(43/2)
1613.2 7	0.15 4	11457.0	(47/2)	9843.7	(45/2)						

† Transitions from 1988Du07 in ($^6\text{Li,p}2n\gamma$), not reported by 2011Si04.

‡ These strong transitions have been placed from 4005 and 3512 levels in earlier studies. Placement given here is from 2011Si04.

2011Si04 state uncertainty of 0.3 keV for strong γ rays and up to 0.7 keV for weak ones. The evaluators assign 0.3 keV for $I_\gamma > 10$, 0.5 keV for $I_\gamma = 3-10$ and 0.7 keV for $I_\gamma < 3$ or when not given.

@ Additional information 1.

& Placement of transition in the level scheme is uncertain.

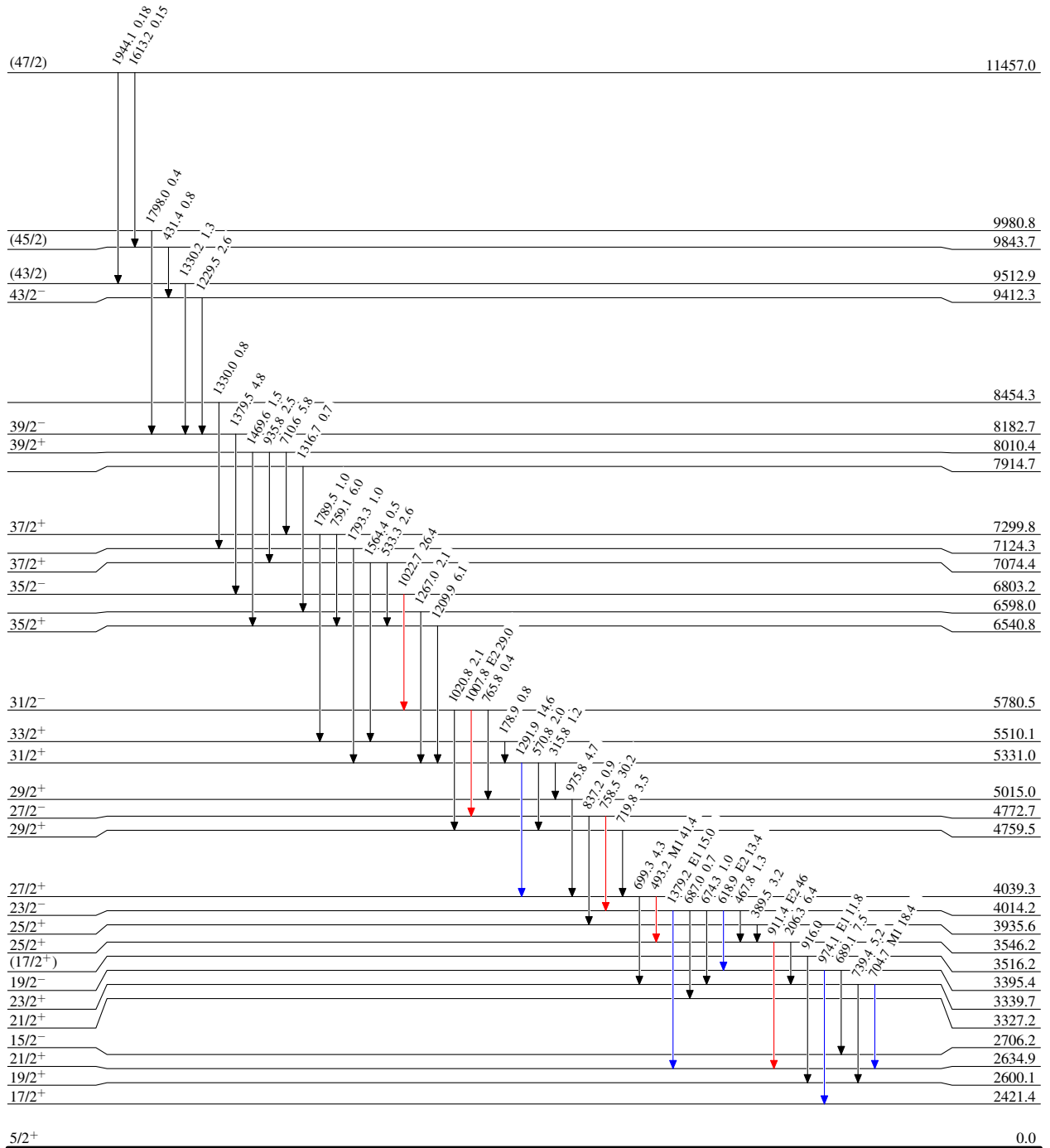
(HL,xn γ) 2011Si04

Level Scheme

Intensities: Relative I γ

Legend

- I γ < 2% \times I γ ^{max}
- I γ < 10% \times I γ ^{max}
- I γ > 10% \times I γ ^{max}







< 4 ns

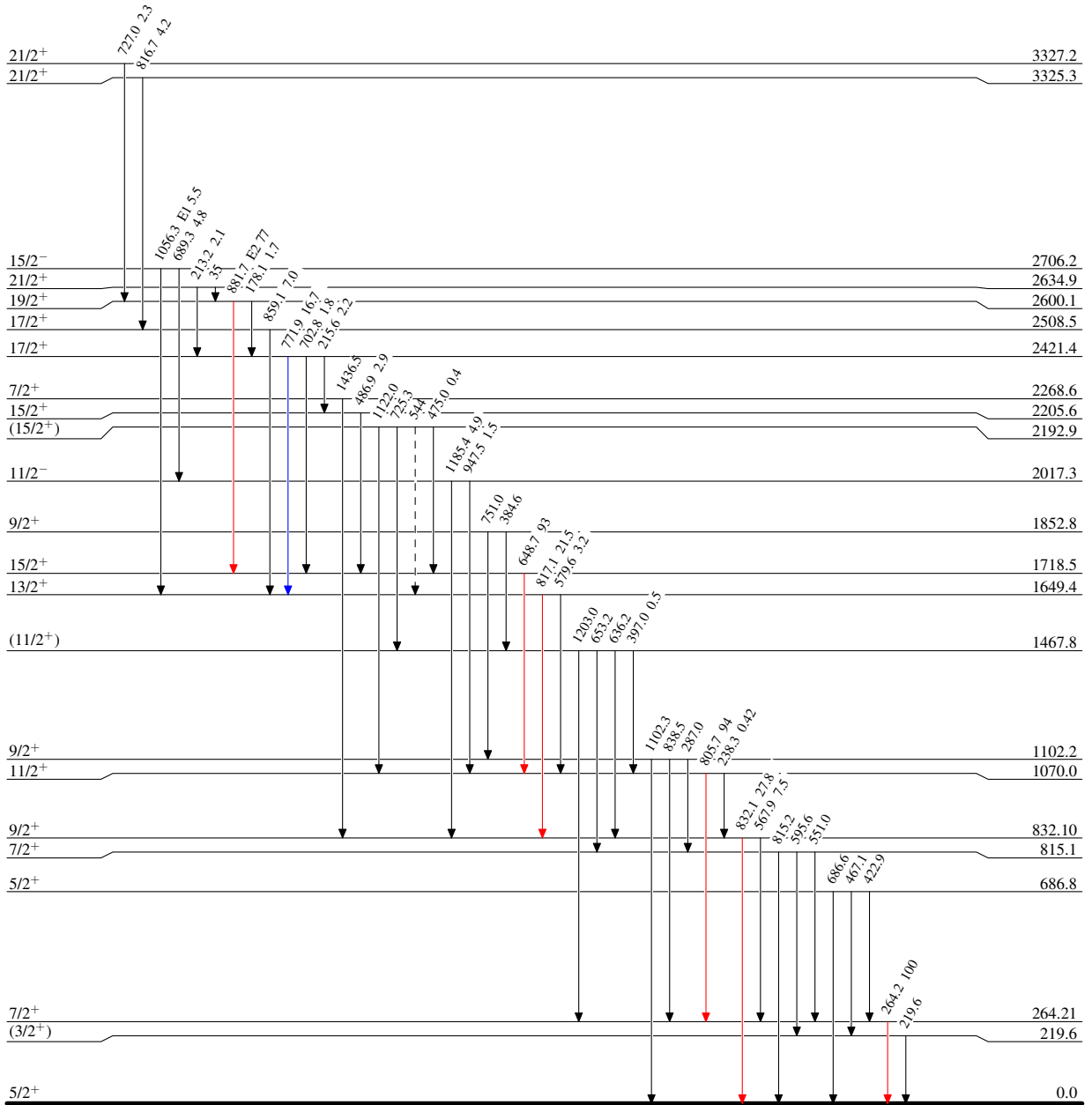
(HI,xn γ) 2011Si04

Level Scheme (continued)

Intensities: Relative I γ

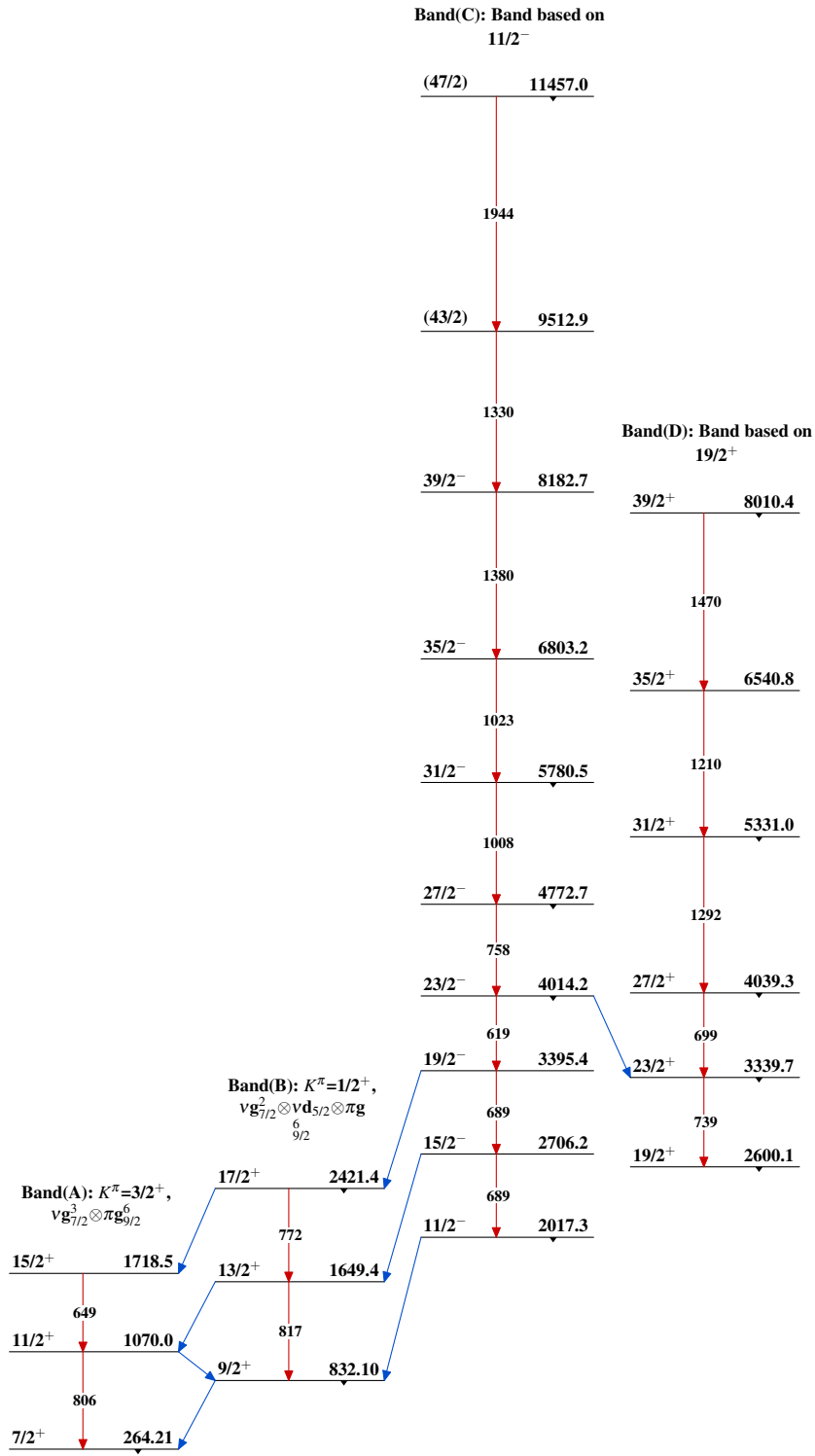
Legend

-  I γ < 2% \times I γ^{max}
-  I γ < 10% \times I γ^{max}
-  I γ > 10% \times I γ^{max}
-  γ Decay (Uncertain)



⁹⁹Pd₅₃

(HI,xn γ) 2011Si04



⁹⁹Pd₅₃